Warranties and Standards Panel

Discussion Paper

ISSUE OVERVIEW

In the highly dynamic world of distributed renewable energy, new technologies, products, financing tools, and business models are rapidly appearing in this complex and emerging market. While rapid innovation is positive in many respects and is driving amazing product and systems innovations as well as financing mechanisms, it also presents certain types of challenges. These challenges include but are not limited to the risk of inefficient capital investment; the risk that technology will be unsafe or will not perform long term; and risk of consumer losses or loss of consumer interest when buyers may not have sufficient knowledge and experience regarding various products.

Product standards, installation standards, and product warranties are one set of tools that can mitigate market risks and serve to stabilize the market. These standards and warranties do so by setting minimum allowable thresholds for the expected performance, durability, and safety of the products and the installations of these products. In other words, the objective is to establish a DG market where small and large consumers can rely and trust in the products and systems that they purchase, many of which are long term power contracts.

BACKGROUND

Product Standards

Product standards serve two primary purposes. First, they assure that a product will effectively serve its purpose by conforming to a set of established and repeatable requirements. Second, they provide reliable information to the marketplace that

eventually results in reduced manufacturing and transaction costs. In order to provide value, standards need to be agreed upon by a broad range of parties and require an avenue for promulgation and enforcement. Product standards can be roughly broken into categories of performance, design, and safety. For numerous renewable energy products, safety standards, spot performance standards, and initial product design qualification standards exist and are in use today.

Photovoltaic panels: Product evaluation to safety standards ANSI/UL 1703 (flat plate photovoltaic modules) and ANSI/UL 1741 (inverters) by a Nationally Recognized Testing Laboratory is often required by the authority having jurisdiction over an installation. Safety standards for concentrating photovoltaics are currently in development. Initial product design qualification standards, IEC 61215/61646 (flat plate photovoltaic modules) and IEC 62108 (concentrating photovoltaics) are voluntary standards, but are often required by more discerning customers. Small Wind Turbine Performance and Safety Standard (AWEA Standard 9.1 – 2009) has been published and will be submitted to ANSI for adoption as a national standard. Few or no products have long term performance or design qualification standards covering lifetime durability and reliability expectations. However, the National Renewable Energy Laboratory and the Japan National Institute of Advanced Industrial Science and Technology have begun initial work to develop a standard that would rate the long term durability of flat plate photovoltaic modules (http://www.nrel.gov/ce/ipvmqa_forum/).

Community-scale wind turbines. The California Energy Commission maintains an Approved Turbine List It is important for the credibility of the program and the overall value to customers and the industry that only certified and reliable turbines are on this list. With the growth of this industry segment, many products are currently in the market that not not been 3rd party tested and certified. According to Tal David Mamo, one industry participant, "Of the current list of CEC approved turbines roughly 65% of them are Chinese turbines that don't have any credible 3rd party testing. In fact most of these turbines have very poor safety records and have a sales price below the incentive value, which enable them to be sold with no money down or risk to the installer or customer. Currently the CEC bases its incentive on the rating of the generator inside the turbine, this says very little about the actual energy that the turbine can produce. We are seeing more and more manufacturers oversize their generators to capture more incentive money without producing more energy. The true test of a turbines potential for generating energy is the swept area of the blades; the larger the blades the more energy they can capture from the wind. I recommend that the CEC reformat the

funding structure of the program to be based on estimated energy output, this estimate would come from using computer simulated sighting tools in conjunction with 3rd party certified power curves. This way the program is incentivizing the right metric, energy production. There are several states that already have this type of program in place, such as New York's NYSERDA program. California doesn't need to recreate the wheel, just to look at how other states have solved these issues."

Installation Standards

Installation standards cover safety, principles, and workmanship. In many respects, installation standards are as important as product standards to the expansion of distributed renewable energy; a sound product installed incorrectly negatively impacts not only the consumer but the overall expansion of renewable energy. Installation standards are often required within state and local building or fire codes and are enforceable through local governmental agency permitting processes. (These local permitting processes are the subject of other conference panels and explore somewhat what installation standards are required for renewable energy installations.)

Electrical installation requirements for photovoltaics are in the National Electrical Code (NEC) Article 690, although the NEC is not recognized in California for the design or construction of structural or architectural assemblies. The California Building Code, Title 24 (which includes the first green building code in the nation, CalGreen) supports both the structural and architectural assembly of PV systems. Cities and counties in California are required to adopt Title 24. Amendments may be made if t hey meet certain criteria and are approved by the California Building Standards Commission. Code enforcement of PV systems is administered at the local level by the Authority Having Jurisdiction. Under the California Building Codes, inspections must be carried out by a code enforcement official trained to enforce structural components of the PV system, as well as an electrical inspector qualified to inspect the electrical components of the system.

The 2011 NEC Article 694 will have requirements for small wind electric systems for the first time. In California, the National Electrical Code is adopted as a part of the building code and known as Title 24, Part 3 California Electrical Code. Additional installation standards, developed in traditional building code channels are starting to appear, such as the photovoltaic installation requirements in the 2012 International Fire Code. Voluntary standards for installation, such as best practice guidelines, can evolve as a

market matures and make significant contributions to the overall quality of installations, reduced installation costs, and uniform industry methods of installation. The North American Board of Certified Energy Practitioners (NABCEP) has voluntary certification programs for photovoltaic and small wind installers and for photovoltaic technical salespersons (http://www.nabcep.org/). SolarTech focuses on best practices development and implementation across nearly all aspects of solar energy (http://solartech.org/).

Warranties

Warranties exist to provide contractual assurance by a seller of a product to a buyer of that product and provide specific remedies if certain predefined conditions are not satisfied. Within the context of renewable energy, warranties can be roughly broken in to the categories of product warranties and performance warranties. Product warranties are tied to manufacturing quality and cover items such as workmanship and material defects. Performance warranties set defined thresholds for product power output under certain criteria such as product age and environmental conditions. Nearly all small wind turbines, photovoltaic modules, and inverters are covered by a product warranty. Typically, only solar electric products, such as photovoltaics, offer a performance warranty. Warranties terms are generally between the manufacturer and the consumer, with the potential for several intermediaries such as contractors, developers, and distributors. In some circumstances, such as renewable energy incentive programs funded by utility ratepayers, warranties are required by regulation. A complication for owners of small renewable energy systems is that an overall system warranty is rarely provided. Different parts of the system are warranted by different parties for different lengths of time. Owners of larger renewable energy systems may contract for full warranty service with their project integrator to avoid this issue.

The California Department of Toxic Substances Control is planning to adopt regulations that will require handling PV panels as special wastes at decommissioning or disposal, similar in many ways to handling of e-wastes like computers or cathode ray tube (CRT) screens. These regs will require specific handling for panels that are likely to pose environmental hazards (eg. cadmium telluride panels that might degrade and release heavy metals). Some manufacturers are offering extended producer responsibility (EPR) packages with the producer taking back panels at the end of life and overseeing recycling or disposal in a responsible manner.

CHALLENGES

- In order to eventually reduce costs, standards need to be uniform across the broadest markets possible. Currently manufacturers of products which could be distributed globally must often meet regional product standards. Work is underway by the UL 1703 Standards Technical Panel to harmonize product safety standards for photovoltaic modules (ANSI/UL 1703 and IEC 61730). When completed this will be a large step forward; however, there are numerous other product standards where harmonization will still be an elusive goal. For installation standards, uniformity is desired so that workforce training and best practices can be broadly applied. National Electrical Code provides this uniformity for electrical installation requirements; however, there are requirements such as wind and snow loading that are determined at a local level. Workforce stakeholders assert that importing building code standards for installations will create a more uniform and stable set of rules which benefits the industry. If standards lack sufficient uniformity, cost reductions will be difficult to achieve due to the need for different versions of highly similar products, more narrowly focused workforce training, and limited applicability of best practices.

- Because many specific products lack long term historical field data, there is insufficient information for market participants, particularly banks and other providers of capital, to adequately assess risk. Exacerbating the problem is a general lack of long term performance or design qualification standards covering lifetime durability and reliability expectations which could form the basis of risk assessment. However, these types of standards are also reliant on long term historical field data. The end result is increased transaction costs, particularly evident in access to and cost of financing.

- Warranty lengths and terms are generally comparable to other products and related industries. For some products, particularly photovoltaics, warranty lengths and terms are far in excess of those typically found in related products and industries. However, the value of a manufacturer's warranty is highly dependent on the long term presence of the manufacturer in the marketplace. (A merged or acquired manufacturer would still be considered as present in the marketplace if the resultant company honors the original manufacturer's warranty.) Additionally, the value of a warranty is highly dependent on the ability of the buyer to make a successful warranty claim. High burdens of proof, such as those typically required to successfully make a claim under the

performance warranty provisions of photovoltaic products, may significantly reduce the actual value of the warranty. These issues are not unlike those faced by consumers in all manners of transactions and product purchases; however, due to the relative immaturity of the renewable energy market there is concern that consumers are not equipped to make informed choices.

- Regarding wind turbines, even if the CEC's Approved Turbine List to only included 3rd party certified and reputable turbines, without criteria regarding appropriate siting to take advantage of wind resources. W turbines will provide very low energy production which again hurts consumers, the industry, and the perception of Distributed Wind systems. This problem will grow as home repair outlets begin to carry more and more community-scale wind products for self-installation. California needs to explore ways to require proper location and installation of turbines if they are to qualify for grant funding. There are some very powerful tools available today such as Wind Analytics which can account for terrain conditions as well as obstacles in determining estimated energy output. It is important to incentivize the right metric -- energy production, and not just the installation of a turbine.

IMPORTANT QUESTIONS TO PURSUE

- How should standards and warranties be enforced, and by whom? Is the status quo working? Who takes the lead for standards development, and how?
- What is the interaction between the manufacturer and the project installer/developer in terms of warranties? How is responsibility parsed between them?
- Can standards and warranties lower manufacturing costs and transaction costs while simultaneously increasing the likelihood of high quality installations and consumer satisfaction?
- How large a problem are fraud and bad practices to the various renewable energy product and technology markets? If they're a problem, how effective can a combination of product standards, installation standards, and product warranties be in helping to avoid fraud or bad practices?

- In the absence of public or ratepayer funding, what is the proper role of state level regulation with regard to standards and warranties? Will the market naturally develop the necessary standards and warranties? If so, will it do so efficiently and in a timely manner?

- Standard development is highly technical, typically iterative, requires feedback from historical experience, and requires consensus from multiple parties. It is necessarily formal and slow; whereas, the needs of the renewable energy industry are dynamic and evolving at an exceptionally quick pace. How do we structure mechanisms to keep pace with innovative technologies while promoting consumer protection and worker safety?

- Could historical field data be analyzed and reported by either government or NGO research entities and then posted as a public data base for the purpose of helping assess capital risk? Thus manufacturers, developers and contractors could incorporate this data in their product and system proposals and financial entities could use it as an evaluative tool thus speeding up the current patchwork system.

- Is it realistic to expect that sufficient standards and warranties is an essential component to reduce the cost of capital for the renewable energy industry?

- To what extent does third party ownership of renewable energy facilities mitigate the consumer's risk exposure? Are there improvements to standards and warranties that would be helpful to facilitate more third party ownership?

- To what extent should state and local product and installation standards development be allowed or encouraged to occur?

- It is quite possible that upcoming grid interconnection and operability requirements in California will require certain product functionality for renewable energy installations prior to development of standards for these product requirements. What should be done in absence of a needed standard? Are there any realistic ways to accelerate standards development in this area?

SUMMARY

The continued development of standards and warranties for both products and technology and installation is an essential component for the attainment of a robust distributed generation market in the State of California. However it is important to note that the panel believes that the state of standards and warranties for the major modalities of renewable energy, ie solar and wind, are not barriers to the implementation of the Governor's 12GW deployment of distributed generation energy.

There are other more significant issues that pose barriers that are the subject of discussion on other panels.

How these questions above are answered drives the reality of the establishment and expansion of a vibrant renewable energy market. The state of California can lead the US into a new era of distributed renewable energy as an accepted component of our nation's energy portfolio. The development of the responses to this panel can guide important industry decisions on how to move forward as the market matures. Like most business stories, it is awareness about the challenges of growth and the creative application of focused attention and collaborative process that will assure success. Finding the balance of unrestrained innovation with basic rules for performance and quality is the goal.